



The Role of Health Educators in Dealing with Biological Threats in the United States

Miguel A. Pérez, Helda Pinzón-Pérez, and Sherman Sowby

ABSTRACT

Health educators play a key role in assisting the nation deal with and be prepared for potential biological attacks. This article summarizes information found in the literature about likely bioterrorist threats to the U.S. population and discusses the responsibilities of health educators in regard to these threats. Among the important roles health educators should play are dispelling misconceptions and erroneous information associated with biological threats as well as minimizing panic from real or perceived attacks.

Health educators have the implicit responsibility of identifying health issues that may adversely impact the populations they serve. Traditionally health educators have fulfilled this responsibility by developing prevention strategies designed to decrease morbidity and mortality rates from the leading causes of death in the U.S. population. This traditional view is evident in the 10 topic areas covered in Comprehensive School Health Education Programs (Summerfield, 1995). Although this list addresses the leading morbidity and mortality factors, it now seems inadequate as it fails to address new and emerging topics, such as bioterrorism and biological threats to the U.S. population.

For years experts have warned of the possibility of biological and/or chemical attacks against the United States (Cole, 1996; Henderson, 1998; Lederber, Shope, & Oaks, 1992; Leggiadro, 2000; Takafuji, Johnson-Winergar, & Zajtchuk, 2001). However, due to a number of factors

including the low probability of an actual occurrence and a public health care system neither designed to assess the likelihood of nor to deal with the aftermath of a biological attack (Centers for Disease Control and Prevention [CDC], 2001a; Kauffman, Meltzer, & Schmid, 1997), health educators have paid little, if any, attention to addressing those issues until now. The events experienced during the fall of 2001 have led some authors to conclude that "Bioterrorism is no longer a hypothetical hazard but a real one, as dangerous as nuclear war" (Cowley, 2001, p. 40).

Although health educators cannot directly prevent a biological attack, they can fulfill their role as resource persons through their dedication to decreasing mass panic resulting from limited factual information related to potential biological threats. For health educators to successfully meet this responsibility, they must become familiar with the scientific facts behind health concerns such as anthrax,

smallpox, and other public health issues of current relevance.

The purpose of this article is to provide background information about the most probable biological agents that may be used in a biological attack, to introduce the reader to chemical agents that may be used against U.S. populations, and to explore the responsibilities of health educators in providing information to the public. The bases for this article are found not only in the roles and responsibilities of health educators (Association for the Advancement of Health Education, 1991; Hoover, 1980), but also on the precautionary principle that indicates "when an activity

Miguel A. Pérez, PhD, CHES, and Helda Pinzón-Pérez, PhD, CHES, are assistant professors; and Sherman Sowby, PhD, CHES, is a professor in the Department of Health Science at California State University, Fresno, 2345 E. San Ramon Ave. M/S 30, Fresno, CA 93740; E-mail: mperez@csufresno.edu.



Table 1. CDC Bioterrorism Agent Classification, Pathogens, and Diseases They Cause

Category	Category Description	Agents	Diseases Caused
A	Agents that have the greatest potential for adverse public health impact with mass casualties, most of which require broad-based public health preparedness efforts	Variola major <i>Bacillus anthracis</i> <i>Yersinia pestis</i> <i>Clostridium botulinum</i> <i>Francisella tularensis</i> Filoviruses, Arenaviruses	Smallpox Anthrax Plague Botulism Tularemia Viral hemorrhagic fevers
B	Agents that have some potential for large-scale dissemination with resultant illness, but generally cause less illness and death	<i>Coxiella burnetii</i> <i>Brucella</i> spp. <i>Burkholderia mallei</i> <i>Burkholderia pseudomallei</i> Alphaviruses (Venezuelan equine, eastern equine, western equine encephalomyelitis)	Q fever Brucellosis Glanders Meliodosis Encephalitis
C	Agents that are currently believed not to present a high bioterrorism risk to public health, but that could emerge as future threats	Nipah virus Hantavirus	Febrile encephalitic and respiratory illnesses Hanta disease

Source: CDC, 1999; Rotz, Khan, Lillibrige, Ostroff, & Hughes, 2002

raises threats of harm to human health or the environment, precautionary measures should be taken even if some cause and effect relationships are not fully established scientifically” (Kriebel & Tickner, 2001, p. 1351). CDC has embraced this principle, as evidenced in the national plan for dealing with bioterrorism (CDC, 2001a).

BIOLOGICAL AGENTS

Eachempati, Flomenbaum, and Barie (2002) indicate that biological agents are living organisms introduced into an environment with the intent of causing harm. They further indicate that the effects of bioterrorist weapons depend on “lethality” (or the likelihood of illness and death) and “case fatality” (or the number of individuals who die from exposure).

As part of a 1999 congressional initiative, CDC identified and classified a number of biological agents that could be used as potential bio-weapons into three categories (Table 1). Category A agents are

considered to have the highest probability of being used against U.S. targets and on “the probability that their use would result in an overwhelming adverse impact on public health” (Rotz et al., 2002, p. 227).

In classifying agents and assessing their lethality, CDC has taken into account the different varieties of the biological agents, their production methods, and their delivery mechanisms. Franz (2001) concluded, “The most toxic biological materials known are protein toxins produced by bacteria. They are generally more difficult to produce on a large scale than are the plant toxins, but they are many, many times more toxic. Botulinum toxins (seven related toxins), the Staphylococcal enterotoxins (also seven different toxins), diphtheria, and tetanus toxins are well-known examples of bacterial toxins” (p. 7). In this article we will limit the discussion to agents listed in Category A by CDC. Given that most public attention has been focused on the

number of people infected with the *Bacillus anthracis* in various cities around the nation (CDC, 2001b), we will provide the most detail about this pathogen.

Bacillus Anthracis

Anthrax is an acute infectious disease caused by the spore-forming bacterium *Bacillus anthracis*. *B. anthracis*, which has a worldwide distribution, occurs most frequently in animals such as cattle, goats, or sheep that acquire spores from direct contact with contaminated soil (Smego, Gebrian, & Demangels, 1998). *B. anthracis* is not transmitted from person to person (Bell, Kozarsky, & Stephens, 2002). Human infection with *B. anthracis* is most typical through spores from infected animals or their products such as goat hair and ivory tusks (Swartz, 2001). The different forms of anthrax are discussed below.

Inhalation Anthrax

It is considered the most lethal form of the disease and results from inspiration of 8,000–50,000 spores of *B. anthracis* (CDC,



2000, 2001b). The symptoms associated with inhalation anthrax resemble viral respiratory illnesses, including upper respiratory infections, shortness of breath, and low levels of oxygen in the circulating blood with changes in the heart. Initial symptoms include mild fever, muscle aches, and malaise, which may progress to respiratory failure and shock. Meningitis (inflammation of the protective membranes covering the spinal cord and brain) also has been diagnosed in some individuals infected with inhalation anthrax. The Food and Drug Administration has approved Ciprofloxacin, doxycycline, and penicillin G for prophylaxis of inhalation anthrax (Bell et al., 2002).

The incubation period of inhalation anthrax varies from 1 to 7 days, although onset of symptoms could be delayed as much as 60 days after exposure. Case-fatality estimates for inhalational anthrax were originally estimated to be well over 50% (CDC, 2001b). However, recent data seems to indicate that fatality rates may not be as high as once believed, perhaps as low as 20%.

Cutaneous Anthrax

This form of anthrax is considered the most common form. Cutaneous anthrax is characterized by generally painless skin lesion(s) resulting from exposure to *B. anthracis* that has entered the body through broken skin (Bouska Altman, 2002). Individuals exposed to the pathogen may also experience fever, malaise, headache, and regional lymphadenopathy (swelling of the lymph nodes). The incubation period ranges from 1 to 12 days (Bell et al., 2002; Dixon, Meselson, Guillermin, & Hanna, 1999) with a case fatality rate of approximately 20% (Chin, 2000; Smego et al., 1998).

Gastrointestinal Anthrax

This form of anthrax usually follows eating raw or undercooked contaminated meat and is characterized by severe abdominal pain followed by fever and signs of generalized infection. It may be characterized by lesions in the base of the tongue, dysphagia (difficulty swallowing), fever,

regional lymphadenopathy, nausea, loss of appetite, and fever followed by abdominal pain, hematemesis (bloody vomitus), and bloody diarrhea. Gastrointestinal anthrax has an incubation period of 1 to 7 days. The case-fatality rate is estimated to be between 25 and 75% (CDC, 2000).

Smallpox

In the history of mankind, smallpox, caused by the variola major virus, is the only known disease that has been eradicated through public health efforts with the last documented naturally occurring case of smallpox reported in Somalia in October 1977. Three years later the World Health Assembly recommended that vaccination efforts be ceased worldwide (Henderson et al., 1999).

After the disease was officially eradicated, all known stocks of the variola virus were stored under security in two locations: one at CDC in Atlanta and the second at the State Research Center of Virology and Biotechnology in the Russian Federation. In 1999 the World Health Organization recommended that all stocks of variola virus be destroyed (Henderson et al., 1999); however, neither the United States nor Russia made any efforts to destroy their existing stockpiles. Most bioterrorism experts suggest that since the collapse of the Soviet Union, clandestine supplies of the variola virus have come into the possession of other nations and terrorist groups.

Smallpox has killed more people than any other infectious disease, approximately one half billion in the 20th century alone (Chin, 2000). Unlike most other germ warfare agents, smallpox is the only Category A disease that can be transmitted from one person to another (Eachempati et al., 2002). Because the public inoculation programs for smallpox ended about 25 years ago and the duration of immunity provided by the vaccine is thought to be less than 20 years, one could conclude that most of the world's population is susceptible to infection.

Clinical signs of smallpox include high fever, malaise, skin lesions, and prostration with headache and backache. Severe

abdominal pain and delirium may also be present (Henderson et al., 1999). Prior to eradication, smallpox had a case fatality rate between 20–50% (Broad, Engelberg, & Glanz, 2001).

The current U.S. government supply of the vaccine is about 15 million doses (Chin, 2000). Since the September 11, 2001, terrorist attacks, several manufacturers have indicated their desire to seek Food and Drug Administration authority to begin producing the vaccine. Furthermore, federal authorities have authorized studies to determine if current stockpiles can be diluted to increase the number of available vaccines. In November 2001, Health and Human Services Secretary Tommy Thompson announced he was close to signing a contract to purchase enough smallpox vaccine for every American (Connelly, 2001).

Francisella tularensis

Originally discovered in Tulare County, CA, "Tularemia is a zoonosis (a disease carried by animals and passed to humans) caused by the Gram-negative, facultative intracellular bacterium, *Francisella tularensis*" (Evans & Friedlander, 2001, p.1). Tularemia became a biological warfare agent on discovery of its high infectivity once it is aerosolized.

Tularemia can be divided into the two forms: ulceroglandular, affecting about 75% of patients, and the typhoidal found in 25% of patients. Clinical signs present in patients with ulceroglandular tularemia include lesions on the skin or mucous membranes (including the conjunctiva), lymph nodes larger than 1 cm in diameter, or both (Dennis et al., 2001). Patients with typhoidal tularemia tend to show lymph nodes smaller than 1 cm in diameter and without skin or mucous membrane lesions.

The incubation period for *Francisella tularensis* is 3 to 6 days. Patients with the ulceroglandular form of the disease tend to develop several symptoms including fever, chills, headache, cough, and muscle pain (myalgias). Patients may also complain of chest pain; vomiting; pain in the joints (arthralgia); sore throat; abdominal pain;



diarrhea; pain during urination (dysuria); back pain; or stiff neck. It is estimated that the case fatality rate for tularemia is 1.4% (Dennis et al., 2001).

Plague

Yersinia pestis is the causative agent of the plague. Plague presents itself in two major forms: bubonic, affecting the skin, and pneumonic, affecting the lungs. Bubonic usually occurs as the result of a bite by an infected flea. Pneumonic plague can develop as a secondary infection of bubonic plague (Inglesby et al., 2001).

As a bioterrorism agent the bacillus could be aerosolized, inhaled directly into the lungs, and direct pneumonic plague could result. A patient who does not receive adequate therapy for primary pneumonic plague within 18 hours of onset of respiratory symptoms is not likely to survive. If treatment is started within 8 to 18 hours of onset of pneumonic plague, antibiotics are usually highly effective (Bahmanyar & Cavanaugh, 1976; CDC, n.d.). There is a vaccine available that confers some protection against bubonic plague, but none against pneumonic plague (Chin, 2000).

For years the plague bacillus had been readily available at biological supply houses in the United States. However, increased controls implemented as part of homeland defense initiatives have limited its availability to the general public. A biological attack with plague is considered a serious health concern by CDC (CDC, 2001b) because the bubonic plague has a case fatality rate of 50 to 60% and untreated primary septicemic and pneumonic plague are invariably fatal (Chin, 2000).

Botulism

The obligate anaerobe spore forming bacteria, *Clostridium botulinum*, is responsible for producing the toxin that causes botulism. Due to its aggressive nature, botulism has been called the "most poisonous substance known" (Eachempati et al., 2002, p. 182). Its clinical features include cranial neuropathies (diseases affecting the cranial nerves that serve the muscles of the face and neck), including drooping eyelids, weakened jaw clench, and difficulty swallowing

or speaking. Other signs and symptoms include weakness of the extremities, which affect both sides equally and progressively in a pattern that descends from the central part of the body to the extremities; blurred vision or diplopia; and respiratory dysfunction from respiratory muscle paralysis or upper airway obstruction (CDC, 2001b).

Foodborne botulism involves similar clinical manifestations to the inhalational form of botulism, but it also includes gastrointestinal symptoms (CDC, 2001b). Treatment for botulism includes a botulinum antitoxin as soon as possible (Chin, 2000), ventilatory support therapy, equine trivalent antitoxin specific to botulism toxins, nutritional support, treatment for secondary infections, and intensive care (Bouska Altman, 2002), and recovery can take months.

Botulinum toxins are very toxic, can cause death by paralyzing respiratory muscles, and can be obtained relatively easily with current technology. The case-fatality rate in the United States for foodborne botulism is 5 to 10%. No one is quite sure what the death rate for untreated cases is, but it is presumed to be close to 100%.

Hemorrhagic Fevers

Hemorrhagic fevers may be caused by filoviruses such as Ebola or Marburg, which have an incubation period of 5 to 10 days. The onset of symptoms is generally characterized by nausea; fever; myalgia; abdominal pain; diarrhea; chest pain; cough; pharyngitis; and headache (CDC, 2001b). Patients typically bleed from the eyes, nose, and ears. Capillaries lose their ability to contain blood; internal organs liquefy and identify the disease as hemorrhagic.

These fevers have extremely high death rates and are very contagious. Case-fatality rates of Ebola infections in Africa have ranged from 50% to nearly 90% (Chin, 2000). Approximately 25% of the reported Marburg virus infections have been fatal. Although a number of viral infections may produce hemorrhage, only Lassa, Marburg, Ebola, and Crimean-Congo are known to

have a horizontal transmission mode and affect humans (CDC, 1988). There is no known treatment for these diseases.

Chemical Agents

The U.S. Army Medical Research Institute of Chemical Defense (USAMRIID) defines chemical agents as "a chemical substance...intended for use in military operations to kill, seriously injury, or incapacitate humans (or animals) through its toxicological effects" (USAMRIID, n.d.). USAMRIID has classified chemical agents as lung-damaging agents (choking agents), blood agents (cyanogens), blister agents (vesicants), nerve agents (anticholinesterases), and incapacitating agents. There seems to be an agreement among public health officials that the threat from weaponized chemical agents is minimal at this time. This is due in part to the fact that the handling and delivery of chemical weapons requires specialized knowledge and training.

THE PUBLIC HEALTH RESPONSE: THE ROLE OF HEALTH EDUCATORS

Biological attacks during fall 2001 provide a wide array of challenges and opportunities for health educators and other public health workers. Among them, we find the opportunity for health educators to become knowledgeable about biological and chemical weapons—a topic not found in the traditional content areas covered by health educators—and to develop easy-to-understand educational and prevention strategies. Health educators have also a unique opportunity to decrease panic among U.S. residents resulting from lack of accurate and timely information related to biological agents.

Other challenges and opportunities are found in increasing calls for collaboration between health educators and public health officials in developing appropriate responses to bioterrorism threats in the United States. This need and willingness for a multidisciplinary approach to dealing with biological agents was shown during the October 2001 American Public Health Association annual meeting which, in a

**Table 2. Core Competencies for Public Health Workers in Response to Bioterrorist Threats**

Describe the public health role in emergency response in a range of emergencies that may arise
Identify and locate the agency emergency response plan
Describe the public health worker functional role and responsibilities in emergency response and demonstrate his/her role in regular drills
Demonstrate correct use of all communication equipment used for emergency communication
Describe the role of the public health workers in emergency response within the agency, with the media, with the general public, and at the personal level
Identify limits to his/her own knowledge, skills and authority and identify the key system resources for referring matters that exceed these limits
Apply creative problem solving and flexible thinking to unusual challenges within his/her functional responsibilities and evaluate the effectiveness of all actions taken
Recognize deviations from the norm that might indicate an emergency and describe appropriate action

Source: Center for Health Policy, 2001.

quick response to current events, added sessions dealing with bioterrorism. These sessions were used by experts from government, academia, and the community to initiate work in defining the role of public health officials in response to biological threats. Not surprisingly, CDC, in its role as the lead federal agency in dealing with bioterrorist threats, has promulgated several core competencies that public health workers, including health educators, ought to develop in preparing for a state of emergency. These guidelines are listed in Table 2.

Health educators traditionally have been employed in settings including schools, worksites, medical care facilities, community settings, and government agencies. The following section suggests strategies that can be implemented by health educators employed in specific settings. It should be noted, however, that the call to be knowledgeable and serve as resource persons about issues related to bioterrorism applies to health educators regardless of the setting.

School Settings

Health educators in school settings have a unique opportunity to address issues related to bioterrorism among the students they serve. Elementary and secondary school teachers could begin to address these needs by becoming knowledgeable about the topics, by inviting experts to speak in their classes, by developing community awareness campaigns, and by modifying existing curricula to include sections on bioterrorism in an age-appropriate manner.

Health educators in higher education, working in multidisciplinary teams, may develop community seminars about bioterrorism, update web sites at their academic institutions, offer new courses, and serve as experts to local and national media outlets.

Worksites

Health educators employed by private companies may address the needs of their constituents by becoming knowledgeable about the topics, by sponsoring workshops on the basic facts related to biological agents and the public's reaction to

bioterrorism, by working closely with public health departments to design sound educational campaigns, and by including articles about bioterrorism in their employee newsletters. Those with access to technology may include links to web sites with information about these topics (Table 3).

Medical Settings

Health educators employed in medical settings need to work with medical care providers in "identifying sentinel cases, raising their index of suspicion when unexplained clusters of illness appear" (Cross, 2001, p. 54). Health educators in medical settings can also reach their communities via free educational campaigns about bioterrorism and through mailings directed at former patients. Health educators in these settings should also work closely with members of the media to educate them about biological threats.

Community Settings

Health educators employed in community settings can provide workshops on biological agents and bioterrorism. Similarly, health educators employed in these settings can work with national health-related organizations (e.g., American Red Cross, American Cancer Society) to ensure they develop an appropriate focus on biological agents. Finally, community-based health educators may include sections on biological agents during their health fairs. An educational tool that could be employed at these health fairs is found in Table 4.

Government Agencies

An October 2001 study by the National Association of County and City Health Officials found that almost 80% of public health departments did not have comprehensive bioterrorism response plans (American Public Health Association, 2002). Health educators in public health settings need to coordinate the efforts of public health planners and other officials to ensure their counties are adequately prepared to deal with a biological attack.

Health educators employed by federal, state, and local agencies need to work

**Table 3. Selected Sources of Information on Biological Agents**

Description	URL
Public Health Emergency Preparedness and Response	http://www.bt.cdc.gov/
Coping with Terrorism	http://www.oes.ca.gov/
California Highway Patrol: Precautions to follow when handling mail	http://www.dot.ca.gov/safety
General information on anthrax	http://www.bt.cdc.gov/Agent/Anthrax/Anthrax.asp
What constitutes a suspicious letter or parcel?	http://www.usps.com/news/2001/press/pr01_1010tips.htm
U.S. Department of Health and Human Services: Questions and answers about anthrax prevention and treatment	http://www.hhs.gov/news/press/2001pres/20011010a.html
Information regarding anthrax, also available in Spanish	http://www.cdc.gov/ncidod/dbmd/diseaseinfo/anthrax_g.htm
Fact sheets on selected biological issues	http://www.csufresno.edu/hlthsci/bioinfo.htm
American Society of Microbiology	http://www.asm.org
Infectious Diseases Society of America	http://www.idsociety.org

diligently, in collaboration with CDC, to develop and disseminate information to their constituencies. Electronic efforts through the creation of web sites (Table 3), listservs, and other communication venues are some examples of efforts that can be taken in this area.

General Recommendations

Perhaps one of the most important recommendations, regardless of the setting where the health educator might be employed, is reducing public panic regarding the threat from biological agents. The anthrax scare experienced during fall 2001 illustrates the need for health educators to promptly respond to public panic with accurate information about specific biological agents. It is hypothesized that the implementation of prompt mass education campaigns will decrease fear experienced by the U.S. population (Glass & Schoch-Spana, 2002).

A second recommendation for all health educators is to be mindful of educating the public against the indiscriminate use of medications to protect themselves from

perceived biological threats. A nationwide example was the public's demand for Cipro as a prophylactic measure. Health educators need to become advocates of the importance of the responsible use of Cipro and other medications to reduce further health problems such as antibiotic resistance.

A third general recommendation is summarized by Cohen and Vena (2001), who challenge us to remind the public that "a much greater public health risk comes from natural disease outbreaks and resurgent infectious diseases, foodborne illnesses, obesity, diabetes, microbial resistance, the worldwide AIDS epidemic, as well as tobacco abuse" than from biological attacks. Therefore, although we each must take steps to be prepared for potential biological attacks, we should not neglect less dramatic events that may pose a greater threat to our well-being.

A fourth recommendation for all health educators is a call to become advocates for greater resource allocation to public health efforts. Advocacy efforts could also include efforts to address social justice and peace.

To paraphrase Cohen and Vega (2001), we need to move our nation from a state of national scare to a situation of national care.

Finally, health educators are encouraged to constantly update their knowledge about the pathogens and conditions described in this article to design and implement educational programs on early recognition of symptoms and to share, with the general public, knowledge related to appropriate access to health care services. Table 4 was formulated as a readily available resource health educators may use in addressing this area.

Although this section summarizes some ideas for the roles health educators can play in addressing the nation's educational needs in regard to bioterrorism, it is not meant to be all-inclusive. Additional ideas, applications, and suggestions should be explored and shared using our professional journals and communication media.

CONCLUSION

The invulnerability once felt by most Americans was dispelled following events

**Table 4. Summary Information About Category A Biological Agents**

Pathogen	Disease Caused	Forms	Transmission Mode	Signs & Symptoms	Treatment/Prophylaxis
<i>Bacillus anthracis</i>	Anthrax	Cutaneous Intestinal Pulmonary	Ingesting spores, skin lesions, inhaled spores ^d	Cutaneous: red macule, ulcer. Inhalation: cough, headache, fever, vomiting, chest pain, dyspnea, and syncope ^e	Ciprofloxacin and amoxilin ^b
<i>Clostridium botulinum</i>	Botulism	Foodborne Wound Infant intestinal Adult intestinal ^f	Foodborne, through ingestion of food containing the toxin Wound through contamination of a wound by the toxin in which anaerobic conditions develop	Symmetric cranial neuropathies (drooping eyelids, difficulty swallowing or speaking), muscular weakness, blurred vision, respiratory dysfunction, upper respiratory obstruction ^a	Botulinum antitoxin as soon as possible, ventilatory support therapy, equine trivalent antitoxin specific to botulism toxins, nutritional support, treatment for secondary infections, and intensive care
Ebola-Zaire, Ebola-Sudan, and Ebola-Ivory Coast ^c	Ebola hemorrhagic fever	Ulceroglandular Oculoglandular Typhoidal	Direct contact with blood, body secretions, or contaminated objects	Fever, headaches, muscle aches, stomach pain, fatigue, diarrhea, chest pain, shock, bloody diarrhea, blindness, sore throats	Antibiotics, Supportive therapy consisting of balancing electrolytes, maintaining oxygen status and blood pressure, and treating complicating infections.
<i>Francisella tularensis</i>	Tularemia	<i>Francisella tularensis</i> biovar tularensis (Type A) <i>Francisella tularensis</i> biovar palaeartica (Type B)	Bite of infected ticks, through the skin via contact with contaminated animal products, mucus membranes, gastrointestinal track, lungs or contact with contaminated animal products ^{f,g}	Fever, chills, pneumonia, hilar lymphadenopathy, headaches, backaches, chills, rigors, and pharyngitis	Streptomycin, Gentamicin, aminoglycosides, Tetracyclines and chloramphenicol ^h
<i>Variola major</i>	Smallpox	<i>Variola major</i> <i>Variola minor</i> (alastrim)	Direct contact with mucous membranes	Influenza-type symptoms, high fever, pain, small papules, vesiculation, pustules	Believed to be eradicated. Vaccinations. No anti-viral treatment, but may respond cidofovir ^d
<i>Yersenia pestis</i>	Plague	Bubonic Pneumonic	Primarily through flea bites	Fever, cough with mucopurulent sputum, dyspnea, hemoptysis, and chest pain, septicemia ^a	Stretomycin, Gentamicin (not FDA approved in the US for plague treatment), Tetracycline or doxycycline ^{d,h}

^a CDC, 2001; ^b Bell, et al., 2002; ^c CDC, 1999; ^d Cross, 2001; ^e Bouska, Altman, 2002;^f Eachempati, Flomenbau, & Barie, 2002; ^g Dennis et al., 2001; ^h Inglesby et al., 2000



during fall 2001. These events served to remind us that a fundamental element in our lives is the right to live without fear. Glass and Schoch-Spana (2002) have suggested that access to information and a public health system willing to address population needs will go a long way in decreasing fears related to potential biological attacks. Health educators along with government public health officials, physicians, and professional organizations have a responsibility to respond to public calls for accurate information related to biological threats, thereby decreasing the public's fear in regard to their vulnerability.

CDC (2001c) has concluded that when it comes to bioterrorism "as with military preparedness, our public health system must be ready at all times to ward off threats and respond to crisis" (p.6). In their roles in serving as community resource persons, health educators must play a key part in addressing public health threats and controlling mass hysteria. Contributing to and disseminating accurate and current knowledge and information are the best weapons health educators can deploy during a national crisis.

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